REMARKS / ARGUMENTS

Claims 21-26 were objected to because of some informalities. Those informalities have been corrected; "course" has been changed to "coarse" in lines 15 and 16 of claim 21. Claims 22-26 depend from claim 21. Thus, the objection of claims 21-26 is deemed to be overcome.

The Examiner's "Response to Arguments" has been fully considered, and the all of the claims have been amended so as to make the invention more clearly defined by the claims and to overcome the cited prior art. Consequently, the issues raised in the "Examiner's Response" section have all been addressed by claim amendments so as to render all of the Examiner's objections and rejections of the claims moot and/or overcome.

In particular, the Examiner asserts that Nichani discloses an image-based inspection method, and that the independent claims do not include the limitation of Golden Template Analysis or PatInspect, but merely an image-based inspection. To make more clear the distinction between Applicant's invention and the prior art, the claims have been amended such that an image-feature-position-based inspection tool is required in all the claims. Both Golden

Template Analysis and PatInspect are examples of image-feature-position-based inspection tools.

In the case of Golden Template Analysis, a Golden Template is compared with a run-time image. Any image features, such as single pixels, or patterns of pixels, that are not in the correct **position** are indicated as defects. Likewise, PatInspect is capable of detecting incorrectly positioned features of an image. By contrast, Nichani teaches three parameters that together are used to determine the presence/absence of a check-mark (Col. 13, lines 40-57). The three parameters are average of the gray level value, edge count, and shape score are all AGGREGATE measures of an image, each excluding position information. Each of the three parameters taught by Nichani **cannot** convey position data for each image feature. Computing each of the three parameters **loses** individual feature position information. Thus, Nichani does NOT teach or suggest an image-feature-position-based inspection tool. By contrast, Golden Template Analysis and PatInspect, and other image-feature-position-based inspection tools preserve and analyze feature position information for each image feature in an image to be inspected.

Further, Nichani teaches away from employing any image-feature-position-based inspection tool. Such inspection tools can be found in the prior art, including Companion, but since Nichani states that "it is desired to determine which check boxes in a group of boxes are checked" (col. 13, lines 41-42), one of average skill in the art would avoid using an image-feature-position-based

inspection tool. This is because one of average skill in the art of machine vision

would know that to use an image-feature-position-based inspection tool for

detection of check marks in a box would be prohibitively complex, involving an

enormous set of templates to account for the many possible check marks that

can be made in a box. This level of complexity can be avoided, however, since

simple presence/absence tests can be used that ignore the specific positions of

all the millions of possible hand-drawn check marks. In fact, that's why Nichani

teaches merely detecting the presence/absence of check marks (col. 13, lines

45-47), and not actually inspecting the checkmarks themselves.

The Examiner asserts that Nichani does not teach away from using a

single tree, stating that Nichani discloses a single search tree in Fig. 7. However,

Nichani states clearly that "Fig. 7 is an abstraction illustrating a Minimum

Spanning Tree effected with a one dimensional linked list" (col. 5, lines 14-15),

also stating that "each MST, in this illustrative embodiment, is a doubly linked list

... formed by pointers stored in the individual box data structure(s)" (col. 10, lines

9-12). Thus, Fig. 7 merely illustrates the structure of an illustrative Minimum

Spanning Tree. Nowhere in Nichani is a statement that the minimum spanning

tree shown in Fig. 7 could function alone, without other minimum spanning trees

so as to form a minimum spanning forest.

A minimum spanning forest is a necessary aspect of Nichani. For

example, in the Abstract, Nichani states that "The fine alignment process uses

the minimum spanning forest ("MSF") to locate each characteristic of interest in a selected order by reference to another, nearest, previously located characteristic" (Abstract, lines 20-23). The fine alignment process is a major aspect of Nichani (see col.12 – col. 13). Without fine alignment, Nichani would not function adequately. Consequently, Nichani requires a Minimum Spanning Forest. Therefore, Nichani does NOT teach the use of only a single Minimum Spanning Tree, as shown in Fig. 7. Thus, Nichani DOES teach away from using a single search tree.

The Examiner continues to assert that "the number of trees would be a matter of design choice depending on the number of alignment points". However, Nichani merely states that "In an alternative embodiment, the number of trees can be manually input" (col. 10, lines 2-3). Note well that "trees" used in this citation to Nichani is plural – Nichani contemplates **more** than one tree. In fact, Nichani repeatedly refers to a plurality of Minimum Spanning Trees throughout the specification -- Nichani does not teach, suggest, or motivate any design choice involving only a single Minimum Spanning Tree. Also note well that Nichani makes NO mention that the user has free choice, only that the number of trees can be manually input. In fact, there is no choice, since the method of Nichani requires that the number of trees reflect the number of alignment points (col. 9, lines 64-67).

Further, even if there were a case where there was only one alignment point, there MUST be only one Minimum Spanning Tree – no choice is involved.

24

This is because "each local alignment point serves as a root of a tree, so the number of trees can be determined by processing the individual box data structures to obtain local alignment point information." (col. 9, lines 65-67, col. 10, line 1). BUT, there can be NO case in which only one alignment point would be present, since "each local alignment point is associated with one or more geographical groupings of characteristics of interest, e.g., check box(es), and when the exact position of each local alignment point is determined the approximate position of respective characteristics or check boxes associated with the local alignment point is then known." (col. 4, lines 12-17). Thus, if there were only ONE local alignment point, it would not be just a local alignment point – it would be GLOBAL in that ALL geographical groupings of characteristics of interest would be associated with the single local alignment point. Yet, this is not possible, since Nichani discusses a method and apparatus for inspection of characteristics on non-rigid packages, i.e., packages that are NOT flat, such as film cartridge development packages (see Title and Fig. 1). Such non-rigid surfaces require MULTIPLE local alignment points, and therefore, multiple Minimum Spanning Trees, i.e., a Minimum Spanning Forest. By contrast, Applicant claims only a **single** search tree.

Regarding Ueda, although Ueda clearly shows dividing a region of interest in its entirety into a plurality of non-overlapping sub-regions, Ueda does NOT teach any inspection method, instead teaching a character recognition method.

25

The output of such a method is a character code. (see Abstract, lines 9-15) By contrast, Applicant claims a method for **inspecting** a spatially distorted pattern. The end result of the now-claimed image-feature-position-based inspection is a difference image, a match image, a distortion vector field, and/or a pass/fail determination. Note well that Applicant's claims not just dividing a region of interest in its entirety into a plurality of non-overlapping sub-regions, but "dividing the region of interest in its entirety into a plurality of non-overlapping sub-regions, **a size of each of the non-overlapping sub-regions being small enough such that an image-feature-position-based inspecting tool can reliably inspect each of the sub-regions**", as in amended claim 1, for example. By contrast, Ueda is silent on what size each of the sub-regions must be, and provides no mechanism or method for **reducing** the size of the sub-regions so as to <u>ensure reliable</u> character recognition.

The Examiner asserts that Nichani discloses both coarse alignment and fine alignment, and that the claim language does not exclude the use of a coarse alignment tool. However, in Applicant's invention, as <u>now</u> claimed in amended independent claims 1, 6, 14, 21, 27, 34, 35, and 36, for example, **only** a **fine** search tool is used to search within a **plurality** of non-overlapping sub-regions, whereas in Nichani, a **coarse** alignment tool searches in the plurality of windows (sub-regions), as stated in Col. 7, lines 43-46.

26

As stated above, Nichani does not disclose an <u>image-feature-position-based</u> inspection method. Although Companion does disclose an <u>image-feature-position-based</u> method, and Companion can be combined with Nichani, the result would not be Applicant's invention, because of the claim amendments made herein, and because of reasons explained in Applicant's prior response regarding the claims previously presented.

Consequently, due to the claim amendments made herein in response to Examiner's most recent "Response to Arguments", and based on arguments and remarks made herein, all claim rejections are deemed to be either moot or overcome.

Accordingly, Applicants assert that the present application is in condition

for allowance, and such action is respectfully requested. The Examiner is invited

to phone the undersigned attorney to further the prosecution of the present

application.

Respectfully Submitted,

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Russ Weinzimmer
Registration No. 36,717
Attorney for Applicants

P.O. Box 862
Wilton, NH 03086

Tel: 603-654-5670
Fax: 603-654-3556